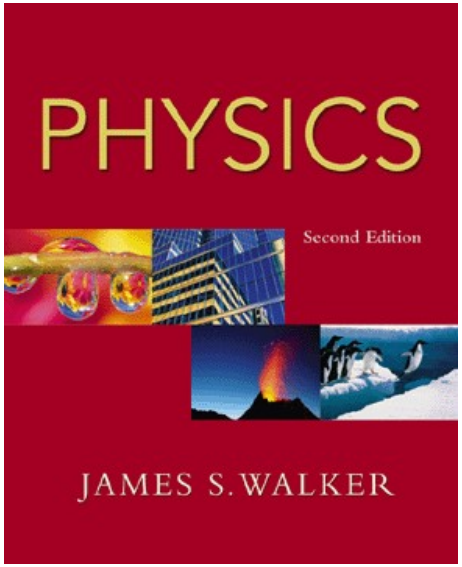
Air Resistance

What Falls Faster?



They all fall at the same rate!

How Is It Possible?

- Air Resistance
  - Force in the opposite direction of the motion of an object through air
  - Also called drag
  - Can be affected by air, motion of object, and object
- Gravity
  - The force that causes objects to move towards the center of the earth
  - Acts evenly all over the world, so all objects fall at the same rate
  - Different on different planets

Kinematic Equations

- Relate distance traveled, velocity, acceleration and time for us to make sense of the information
- For this experiment we can use the distance travelled, starting velocity, and time to figure out the acceleration of an object
- Can we use it with objects that didn’t travel in a straight line?
  - no

Kinematic Equations

Equation	Missing Quantity
$v = v_0 + at$	$x - x_0$
$x - x_0 = v_0 t + \frac{1}{2}at^2$	v
$v^2 = v_0^2 + 2a(x - x_0)$	t
$x - x_0 = \frac{1}{2}(v_0 + v)t$	a
$x - x_0 = vt - \frac{1}{2}at^2$	v_0

x_0= initial position
x= final position
v_0= initial velocity
v= final velocity
a= acceleration
t= time

Why Do Some Things Hit Earth Harder?

- Newton's Second Law of Motion
  - Force is equal to mass times acceleration
  - F=m*a
- Force
  - A push or a pull on an object resulting in interactions with another object
- Mass
  - The amount of matter that there is in an object
  - Not the same as weight!
- Acceleration
  - Measure of the change in velocity over a certain amount of time
- Example: The difference between getting hit with a lacrosse ball and a tennis ball

Experiment

- Observe the difference in how objects fall down to Earth
- Observe the path that different objects take to get down to Earth
- Think about which object exerts the most force on Earth

Experiment

- Follow directions on student sheet
- Drop all of the objects from 1 meter, record the times, weigh the objects
- Discuss Kinematic Equations

Example Calculation

- A lacrosse ball of mass .4kg, took .5 seconds to fall to earth from 1m high, while it was at rest. Given this information, what is the acceleration?